

REMARKS

This responds to the Office Action mailed on May 12, 2008.

Claims 1, 7, 24, 29 and 39 are amended, no claims are canceled, and no claims are added; as a result, claims 1-11, 24-34 and 39-42 are now pending in this application.

Double Patenting Rejection

Claims 1-11, 24-34, and 39-42 were provisionally rejected under the grounds of nonstatutory obvious-type double patenting as being unpatentable over claims 13-15, 19, and 23-24 of co-pending Application No. 11/494,056.

Applicant does not admit that the claims are obvious in view of co-pending Application No. 11/494,056. However, a Terminal Disclaimer will be considered upon receiving an indication of allowable claims in the instant Application.

§103 Rejection of the Claims

Claims 1-4, 7-10, 24, and 39-41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szwejkowski (U.S. '499) further in view of Wu (US 2003/0181055). Applicant respectfully traverses this rejection.

Liu discloses a first photoresist mask 106 to etch a first pattern 108 and then a second photoresist mask 110 to etch a second pattern 112 in an amorphous carbon hard mask 104 and individually removing the photoresist masks 106 and 110 by a plasma process (see figures 2C and 2E). Applicant submits that since Liu etches a first pattern and removes the resist, then reapplies a totally different resist pattern and etches a totally different set of holes in the same single layer, any possible resist residue from the first photoresist pattern would give rise to a potentially serious flaw – which would be mentioned if it were a concern. However, since Liu does not suggest or discuss residual photo resist problems (as previously admitted by the Examiner) then Applicant submits that Liu can not provide any suggestion of treating the surface of the substrate to remove residual resist. Liu does not provide any recognition of such an issue existing at all. Liu teaches a master mask process, and not removal of residual resist.

Szwejkowski removes silicon and oxide sidewall material 26 formed on the sides of photoresist 32 and polysilicon line 28 during an etch of the polysilicon layer 20 (col. 1, lines 32-42, and col. 2, lines 4-11) and not during dry develop. The sidewall material 26 is not a residual portion of the photoresist 32, and is not an organic polymer material (see col. 3, lines 7-11) – it is certainly not carbon rich.

The newly cited reference of Wu is used in the outstanding Office Action to show that a sidewall polymer fence may be removed without damaging the dielectric layer. Applicant submits that Wu teaches and suggests a method removing the photoresist fence 112 from the oxide layer 102 with a method that improves the organic resist to oxide removal rates. The present claims recite a method to *remove residual carbon rich resist disposed in contact with ... the hard mask ...under conditions that are selective to the hard mask and to the substrate* where the hard mask is amorphous carbon, while Wu does not suggest any sort of hard mask and a totally different set of materials.

Applicant respectfully submits that the suggested combination of references fails to describe or suggest at least the claimed features of “...*surface treating the substrate after removing the carbon rich patterned resist to remove residual carbon rich resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to the hard mask and to the substrate...*”, as recited in amended independent claim 1. The proposed combination of references fails to suggest an organic photoresist residue, either on a hard mask or in contact with the substrate. The Office has previously admitted that Liu does not suggest removing residues, and the Office incorrectly identifies Szwejkowski’s residual resist. The other independent claims contain similar language and are held to be allowable over the proposed combination of references for at least that reason.

The dependent claims are believed to be patentable at least as depending from patentable base claims as shown above, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist in contact with the substrate as opposed to in contact with the resist pattern, Applicant requests that this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 5-6, 11, and 25-34 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szwejkowski ('499) further in view of Wu (US 2003/0181055) as applied to claims 1-4, 7-10, 24, and 39-41 in paragraph 10 above, and further in view of Chen ('435). Applicant respectfully traverses this rejection.

Liu is discussed above and contains no suggestion of residual photo resist problems. Szwejkowski is discussed above and does not teach or suggest removal of an organic photo resist residue after removal of the photoresist. Szwejkowski teaches removing a silicon and oxide containing sidewall material 26, which is on a side portion of the photoresist 32, and is not a residue nor a carbon rich organic polymer material. The sidewall 26 is not a photoresist residue. Wu is discussed above and does not suggest any sort of hard mask does not suggest relative etch rates over amorphous carbon and has different materials.

Chen is used in the outstanding Office Action to show that solutions of ammonium hydroxide and peroxide are known in the art. Applicant respectfully submits that the addition of Chen does nothing to cure the above noted failure of the other references to teach or suggest a surface treatment to remove residual photo resist material.

Applicant respectfully submits that the suggested combination of references fails to describe or suggest at least the claimed features of “...*surface treating the substrate after removing the carbon rich patterned resist to remove residual carbon rich resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to the hard mask and to the substrate...*”, as recited in independent claim 1. The combination of references do not suggest a carbon rich photoresist residue removed with selectivity to amorphous carbon hard masks.

Applicant respectfully submits that the remaining independent claims are also patentable over the suggested combination of references for similar reasons. The dependent claims are believed to be patentable at least as depending from patentable base claims as shown above, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist, Applicant requests that this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claim 42 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szwejkowski ('499) further in view of Wu (US 2003/0181055) as applied to claims 1-4, 7-10, 24, and 39-41 in paragraph 10 above, and further in view of Fang ('338). Applicant respectfully traverses this rejection.

Liu, Szwejkowski and Wu have been discussed above. Fang is used in the outstanding Office Action to show that it is known to use solutions including sulfuric acid and citric acid. Applicant respectfully submits that the addition of Fang does nothing to cure the above noted failure to suggest a surface treatment to remove carbon rich residual photo resist material with selectivity to amorphous carbon hardmasks.

Applicant respectfully submits that the proposed combination of references fails to describe or suggest at least the claimed features of “...*surface treating the substrate after removing the patterned carbon rich photoresist to remove residual carbon rich photoresist in contact with the substrate under conditions that are selective to the hard mask and to the substrate...*”, as recited in amended independent claim 39, from which claim 42 depends. The cited references do not suggest removing carbon rich resist residues after removal of the photoresist, or with selectivity to an amorphous carbon hard mask. Thus, the combination of references, even if there were proper motivation shown to make the combination, does not suggest all the recited claim features.

Dependent claim 42 is believed to be patentable at least as depending from a patentable base claim, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist, Applicant requests that this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Reservation of Rights

In the interest of clarity and brevity, Applicant may not have equally addressed every assertion made in the Office Action, however, this does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of

the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's representative at (210) 308-5677 to facilitate prosecution of this Application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Serial Number: 10/788,889

Dkt: 303.867US1

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Title: SURFACE TREATMENT OF A DRY-DEVELOPED HARD MASK AND SURFACE TREATMENT COMPOSITIONS USED THEREFOR

Respectfully submitted,

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Date September 12, 2008

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 12th day of September, 2008.

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Signature [Handwritten Signature]